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Ca^{2+} and K^+ concentrations change during early embryonic development in mouse

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Ions play a fundamental role in nearly all cellular processes. However, it is little known whether how ions regulate early embryonic development. In this study, we examined changes in Ca^{2+} and K^+ currents and concentrations in embryos and oviduct during mouse early embryonic development using patch clamp technique and confocal microscopy. During early embryonic development, K^+ concentration in oviduct increased markedly, but intracellular Ca^{2+} concentration did not change. The membrane potential was depolarized (from -38 mV to -16 mV), and Ca^{2+} current decreased suggesting that these events may coincide. The membrane potential induced by influx of Ca^{2+} first hyperpolarized and then depolarized in mouse oocytes. The hyperpolarization (HP)elicited by Ca^{2+} in membrane potential resulted from activation of K^+ channels. Our results showed that the K^+ channel was not blocked by TEA and apamin, well-known K^+ channel blockers. These results suggest that the K^+ channel that induces HP in mouse oocytes could belong to another K^+ channels including two-pore domain K^+ channel that are insensitive to TEA and apamin, and the changes inions following embryonic development mainly play a critical role in regulation of membrane potential.

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